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of oxygen in the atmosphere was kept up to about 40 per cent., with great benefit to a large percentage of the cases. The practise then inaugurated is being tested at Guy's Hospital by Dr. Hunt, who administered the treatment during the war.

Nor are the advantages of oxygen respiration confined to pathological cases. One of the most direct victims of anoxic anoxæmia is the airman who flies at great heights. Everything in this paper tends to show that to counteract the loss of oxygen which he sustains at high altitudes there is but one policy, namely, to provide him with an oxygen equipment which is at once as light and as efficient as possible—a consummation for which Haldane has striven unremittingly. And here I come to the personal note on which I should like to conclude. In the pages which I have read views have been expressed which differ from those which he holds in matters of detail—perhaps in matters of important detail. But Haldane's teaching transcends mere detail. He has always taught that the physiology of to-day is the medicine of to-morrow. The more gladly, therefore, do I take this opportunity of saying how much I think medicine owes and will owe, to the inspiration of Haldane's teaching.

## INTENSIVE CULTIVATION

By Professor FREDERICK KEEBLE

PRESIDENT OF THE AGRICULTURAL SECTION

THERE is, so far as I can discover, no reason—save one—why I should have been called upon to assume the presidency of the Agricultural Section of the British Association, or why I should have been temerarious enough to accept so high an honor and such a heavy load of responsibility. For upon the theme of Agriculture as commonly understood I could speak, were I to speak at all, but as a scribe and not as one in authority. The one reason, however, which must have directed the makers of presidents in their present choice is, I believe, so cogent that despite my otherwise unworthiness I dared not refuse the invitation. It is that, in appointing me, agriculturists desired to indicate the brotherhood which they feel with intensive cultivators. As properly proud sisters of an improved tale they have themselves issued an invitation to the Horticultural Cinderella to attend their party, and in conformity with present custom, which requires each lady to bring her partner, I am here as her friend.

Nor could any invitation give me greater pleasure: for my devotion to Horticulture is profound and my affection that of a lover. My only fear is lest I should weary my hosts with her praises, for in conformity with this interpretation I propose to devote my address entirely to Horticulture—to speak of its performance during the war and of its immediate prospects.

Although that which intensive cultivators accomplished during the war is small in comparison with the great work performed by British agriculturists, yet nevertheless it is in itself by no means inconsiderable, and is, moreover, significant and deserves a brief record. That work may have turned and probably did turn the scale between scarcity and sufficiency; for, as I am informed, a difference of 10 per cent. in food supplies is enough to convert plenty into dearth. Seen from this standpoint the war-work accomplished by the professional horticulturist—the nurseryman, the florist, the glass-house cultivator, the fruit-grower and market gardener, and by the professional and amateur gardener and allotment holder assumes a real importance, albeit that the sum total of the acres they cultivated is but a fraction of the land which agriculturists put under the plough.

As a set-off against the relative smallness of the acreage brought during the war under intensive cultivation for food purposes, it is to be remembered that the yields per acre obtained by intensive cultivators are remarkably high. For example, skilled onion-growers compute their average yield at something less than 5 tons to the acre. A chrysanthemum-grower who turned his resources from the production of those flowers to that of onion obtained over an area of several acres a yield of 17 tons per acre. The average yield of potatoes under farm conditions in England and Wales is a little over 6 tons to the acre, whereas the army gardeners in France produced, from Scotch seed of Arran Chief which was sent to them, crops of 14 tons to the acre. Needless to say, such a rate of yield as this is not remarkable when compared with that obtained by potato-growers in the Lothians or in Lincolnshire, but it is nevertheless noteworthy as an indication of what I think may be accepted as a fact, that the average yields from intensive cultivation are about double those achieved by extensive methods.

The reduction of the acreage under soft fruits—strawberries, raspberries, currants, and gooseberries—which took place during the war gives some measure of the sacrifices—partly voluntary, partly involuntary—made by fruit-growers to the cause of war-food production. The total area under soft fruits

was 55,560 acres in 1913, by 1918 it had become 42,415, a decrease of 13,145 acres, or about 24 per cent. As would be expected, the reduction was greatest in the case of strawberries, the acreage of which fell from 21,692 in 1913 to 13,143 in 1918, a decrease of 8,549 acres, or about 40 per cent. It is unfortunate that bad causes often have best propagandas, for were the public made aware of such facts as these they would realize that the present high prices of soft fruits are of the nature of deferred premiums on war-risk insurances with respect to which the public claims were paid in advance and in full.

I should add that the large reduction of the strawberry acreage is a measure no less of the shortsightedness of official than of the public spirit of fruit-growers; for in the earlier years of the war many counties issued compulsory orders requiring the grubbing up and restriction of planting of fruit, and I well remember that one of my first tasks as Controller of Horticulture was to intervene with the object of convincing the enthusiasts of corn production that, in war, some peace-time luxuries become necessities and that, to a sea-girt island beset by submarines, home-grown fruit most certainly falls into this category.

Those who were in positions of responsibility at that time will not readily forget the shifts to which they were put to secure and preserve supplies of any sorts of fruit which could be turned into jam—the collection of blackberries, the installation of pulping factories which Mr. Martin and I initiated, and the rushing of supplies of scarcely set jam to great towns, the populace of which, full of a steadfast fortitude in the face of military misfortune, was ominously losing its sweetness of disposition owing to the absence of jam and the dubiousness of the supply and quality of margarine.

But though the public lost in one direction it gained in another, and the reduction of the soft-fruit acreage meant—reckoned in terms of potatoes—an augmentation of supplies to the extent of over 100,000 tons. Equally notable was the contribution to food production made by the florists and nurserymen in response to our appeals. An indication of their effort is supplied by figures which, as president of the British Florists' Federation, Mr. George Munro—whose invaluable work for food production deserves public recognition—caused to be collected. They relate to the amount of food production undertaken by 100 leading florists and nurserymen. These men put 1.075 acres, out of a total of 1,775 acres used previously for flower-growing, to the purpose of food production, and they put

142 acres of glass out of a total of 218 acres to like use. I compute that their contribution amounted to considerably more than 12,000 tons of potatoes and 5,000 tons of tomatoes.

The market growers of Evesham and other districts famous for intensive cultivation also did their share by substituting for luxury crops, such as celery, those of greater food value, and even responded to our appeals to increase the acreage under that most chancy of crops—the onion, by laying down an additional 4,000 acres and thereby doubling a crop which more than any others supplies accessory food substances to the generality of the people.

In this connection the yields of potatoes secured by Germany and this country during the war period are worthy of scrutiny.

The pre-war averages were: Germany 42,450,000 tons, United Kingdom 6,950,000 tons; and the figures for 1914 were: Germany 41,850,000 tons, United Kingdom 7,476,000 tons.

Germany's supreme effort was made in 1915 with a yield of 49,570,000 tons, or about 17 per cent. above average. In that year our improvement was only half as good as that of Germany: our crop of 7,540,000 tons bettering our average by only 8 per cent. In 1916 weather played havoc with the crops in both countries, but Germany suffered most. The yield fell to 20,550,000 tons, a decrease of more than 50 per cent., whilst our crop was down to 5,469,000 tons, a falling off of only 20 per cent. In the following year Germany could produce no more than 39,500,000 tons, or a 90 per cent. crop, whereas the United Kingdom raised 8,604,000 tons, or about 24 per cent. better than the average. Finally, whereas with respect to the 1918 crop in Germany no figures are available, those for the United Kingdom indicate that the 1917 crop actually exceeded that of 1918.

There is much food for thought in these figures, but my immediate purpose in citing them is to claim that of the million and three quarter tons increase in 1917 and 1918 a goodly proportion must be put to the credit of the intensive cultivator.

I regret that no statistics are available to illustrate the war-time food production by professional and amateur gardeners. That it was great I know, but how great I am unable to say. This however I can state, that from the day before the outbreak of hostilities, when, with the late Secretary of the Royal Horticultural Society, I started the intensive food-production campaign by urging publicly the autumn sowing of vegetables—a practice both then and now insufficiently followed—the amateur and professional gardeners addressed themselves to the work of producing food with remarkable energy and success. No less

remarkable and successful was the work of the old and new allotment holders, so much so indeed that at the time of the Armistice there were nearly a million and a half allotment holders cultivating upwards of 125,000 acres of land: an allotment for every five households in England and Wales. It is a pathetic commentary on the Peace that Vienna should find itself obliged to do now what was done here during the war—namely, convert its parks and open spaces into allotments in order to supplement a meager food supply.

This brief review of war-time intensive cultivation would be incomplete were it to contain no reference to intensive cultivation by the armies at home and abroad. From small beginnings, fostered by the distribution by the Royal Horticultural Society of supplies of vegetable seeds and plants to the troops in France, army cultivation assumed under the direction of Lord Harcourt's Army Agricultural Committee extraordinarily large dimensions: a bare summary must suffice here, but a full account may be found in the report presented by the Committee to the House of Parliament and published as a Parliamentary Paper.

In 1918 the armies at home cultivated 5,869 acres of vegetables. In the summer of that year the camp and other gardens of our armies in France were producing 100 tons of vegetables a day. These gardens yielded, in 1918, 14,000 tons of vegetables, worth, according to my estimate, a quarter of a million pounds sterling, but worth infinitely more if measured in terms of benefit to the health of the troops.

As the result of General Maude's initiative, the forces in Mesopotamia became great gardeners, and in 1918 produced 800 tons of vegetables, apart altogether from the large cultivations carried out by His Majesty's Forces in that wonderfully fertile land. In the same year the forces at Salonika had about 7,000 acres under agricultural and horticultural crops, and raised produce which effected a saving of over 50,000 shipping tons.

Even from this brief record it will, I believe, be conceded that intensive cultivation played a useful and significant part in the war: what, it may be asked, is the part which it is destined to play in the future? So far as I am able to learn, there exist in this country two schools of thought or opinion on the subject of the prospects of intensive cultivation, the optimistic and the pessimistic school. The former sees visions of large communities of small cultivators colonizing the countryside of England, increasing and multiplying both production and them-

selves, a numerous, prosperous and happy people and a sure shield in time of war against the menace of submarines and starvation. Those on the other hand who take the pessimistic view, point to the many examples of smallholders who "plough with pain their native lea and reap the labor of their hands" with remarkably small profit to themselves or to the community—smallholders like those in part of Warwickshire, who can just manage by extremely hard labor to maintain themselves, or, like those in certain districts of Norfolk, who have let their holdings tumble down into corn and who produce no more and indeed less to the acre than do the large farmers who are their neighbors.

Before making any attempt to estimate the worth of these rival opinions it may be observed that the war has brought a large reinforcement of strength to the rank of the optimists. A contrast of personal experiences illustrates this fact. When in the early days of the war I felt it my duty to consult certain important county officials with the object of securing their support for schemes of intensive food production, I carried away from the conference one conclusion only: that the counties of England were of two kinds, those which were already doing much and were unable therefore to do more, and those which were doing little because there was no more to be done. In spite of this close application of the doctrine of *Candide*—that all is for the best in the best of all possible worlds—I was able to set up some sort of county horticultural organization, scrappy, amateurish, but enthusiastic, and the work done by that organization was on the average good; so much so indeed that when after the Armistice I sought to build up a permanent county horticultural organization I was met by a changed temper. The schemes which the staff of the Horticultural Division had elaborated as the result of experience during the war were received and adopted with a cordiality which I like to think was evoked no less by the excellence of the schemes themselves than by the promise of liberal financial assistance in their execution. Thus it came about that when the time arrived for me to hand over the controllership of Horticulture to my successor, almost every county had established a strong County Horticultural Committee, and the chief counties from the point of view of intensive cultivation had provided themselves with a staff competent to demonstrate not only to cottagers and allotment holders, but also to smallholders and commercial growers, the best methods of intensive cultivation. In the most important counties horticultural superintendents with knowledge of commer-

cial fruit-growing were being appointed, and demonstration fruit and market-garden plots, designed on lines laid down by Captain Wellington and his expert assistants, were in course of establishment. The detailed plans for these links in a national chain of demonstration and trial plots have been published, and any one who will study them will, I believe, recognize that they point the way to the successful development of a national system of intensive cultivation.

By means of these county stations the local cultivator may learn how to plant and maintain his fruit plantation and how to crop his vegetable quarters, what stock to run and what varieties to grow.

Farm stations—with the Research stations established previously by the Ministry; Long Ashton and East Malling for fruit investigations; the Lea Valley Growers' Association and Rothamstead for investigation of soil problems and pathology; the Imperial College of Science for research in plant physiology, together with a couple of stations, contemplated before the war, for local investigation of vegetable cultivation; an alliance with the Royal Horticultural Society's Research Station at Wisley, and with the John Innes Horticultural Institute for research in genetics; the Ormskirk Potato Trial Station; a Poultry Institute; and, most important of all from the point of view of education, the establishment at Cambridge of a School of Horticulture—constitute a horticultural organization which, if properly coordinated and—dare I say it?—directed, should prove of supreme value to all classes of intensive cultivators. To achieve that result, however, something more than a permissive attitude on the part of the ministry is required, and in completing the design of it I had hoped also to remain a part of that organization long enough to assist in securing its functioning as a living, plastic, resourceful, directive force—a horticultural cerebrum. Thus developed, it is my conviction that this instrument is capable of bringing Horticulture to a pitch of perfection undreamed of at the present time either in this country or elsewhere.

## THE PROBLEMS OF ANTHROPOLOGY

By Professor KARL PEARSON

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**A**NTHROPOLOGY—the Understanding of Man—should be, if Pierre Charron were correct, the true science and the